

the war, M. Pasteur sent back the Diploma of Doctor given to him by the University of Bonn in 1868, and subsequently received a message from the students calling him an impostor and a quack. In 1881 Pasteur was elected a member of the French Academy, succeeding to the seat of M. Littré. About the same time he was made an honorary Doctor of Science of the University of Oxford. In 1887 he was appointed perpetual secretary of the Academy of Sciences, but in 1889, owing to the failure of his health, he was compelled to hand over the duties of this position to M. Bertholet.

At the conclusion of his researches on crystals and wine fermentation, Pasteur commenced an inquiry into the diseases of the silkworm, and in no investigation that he undertook were his method and thoroughness more fully exemplified than in this. When he commenced his inquiry he had never even seen a silkworm, but for four years he spent several months of each year in tracing the germs of the "pebrine" disease through the various stages of development of the worm, egg, larva, chrysalis, and moth. He found what he described as "corpuscles," which he indicated were the contagious elements of the disease. These were taken up from the mulberry-leaves on which they had been previously deposited by diseased moths: some of the worms died, but others went on to the chrysalis and even to the moth stage, still affected by these "corpuscles," and the eggs laid by these moths were also found to contain them. He was convinced that the only way was to breed from moths not affected by the disease, and "to this end he invented the plan which has been universally adopted, and has restored a source of wealth to the silk districts: each female moth, when ready to lay eggs, is placed on a separate piece of linen, on which it may lay them all; after it has laid them and has died, it is dried, and then pounded in water, and, the water is then examined microscopically. If "corpuscles" are found in it, the whole of the eggs of this moth, and the linen on which they are laid, are burnt; if no corpuscles are found, the eggs are kept, to be, in due time, hatched, and yield healthy silkworms."

Pasteur's experiments on fermentation began to have a more direct bearing on disease when Sir Joseph Lister, applying the principles to the changes that occur in wounds, was able by his antiseptic practice to exclude putrefactive and septic germs from wounds, and so to prevent those terrible sequelæ which were the terror of surgeons of the past generation.

Then came Pasteur's great work in bacteriology, his attenuation of the anthrax bacillus and of other pathogenic organisms by which he procured a vaccinating virus, capable of producing a mild form of the disease: as a result of this attack vaccinated animals were protected against the attacks of the non-attenuated organism. This was first proved in connection with fowl-cholera, then in connection with swine erysipelas; but the most important application at that time was in connection with anthrax. His work on hydrophobia is still fresh in the minds of all. Pasteur's work does not end with his death. He had collected in the Institut Pasteur, which was raised as a memorial to his life's work, a band of able and well-trained investigators, who are imbued with the spirit that animated his mind and soul—men who, under his advice and encouragement, are working out the details of the great works that he initiated, who are endowed with some of his great mental power, and who have been fully trained under his eye in the methods of direct experiment and accurate observation, men who have been taught by him "*n'avancez rien qui ne puisse être prouvé d'une façon simple et décisive*," a rule always practised by himself.

France may well offer a public funeral. Louis Pasteur was one of her noblest sons—an honoured one during his life, and deeply lamented now that he is dead.

In Pasteur not only has France lost the greatest French-

man, but the world has lost one of its greatest benefactors, not only of this age but of all time. Letters and telegrams of condolence have been sent by men of light and leading in many nations, and they indicate the sorrow felt unto the ends of the earth. No greater testimony than this could be given of the esteem in which the memory of the great investigator is held. The blessings which the human race owes to Pasteur have been recognised for some time, and now that the mind which gave them birth is at rest, one great outburst of grief arises. The expression of sorrow in France is full and sincere. At the funeral, which is arranged to take place next Saturday, the President of the Republic will be present, and other representatives of the French Government, together with a multitude of fellow-workers and friends who revere Pasteur's memory. The funeral procession will first proceed to Notre Dame, where a solemn requiem will be chanted in presence of the Archbishop of Paris. The body will afterwards be placed in one of the vaults of the cathedral until the celebration of the Centenary of the Institute of France, in three weeks' time, when it will be removed to its final resting-place. It has been arranged that the body of the great investigator shall be finally interred at the Institute which bears his name, and which will form a fitting monument to him. The representatives of science who will be assembled in Paris for the Centenary will accompany the transfer of the mortal remains of their foremost fellow-worker; so that while they unite to celebrate the foundation of the Institute of France, they will join together in sorrow for the deep loss which science has sustained.

NOTES.

THE eleventh International Geodetic Conference was opened at Berlin on Tuesday. Representatives were present from Austria, Belgium, France, Italy, Japan, Norway, Servia, Spain, Sweden, Switzerland, and the United States. The proceedings were opened by Dr. Bosse, the Prussian Minister of Public Education.

A NEW meteorological observatory is reported to have been opened on the Brocken, in the Harz Mountains, on Tuesday. The observations obtained there will be useful for discussion in connection with those made at the observatory on Ben Nevis.

SIR DAVID SALOMONS has arranged for an exhibition of horseless carriages on Tuesday, October 15, at the Tunbridge Wells Agricultural Show Ground, which has been lent to him for the occasion. The carriages will enter the ring at three o'clock p.m. The entrance money received will be used for prizes to be awarded at the show of the Tunbridge Wells and South Eastern Counties Agricultural Society next year, for the best horseless carriages intended to be used for agricultural, trade, and private purposes. Invitation tickets for the exhibition may be secured in order of application by Fellows and Members of the following Institutions sending an addressed envelope to one of the Secretaries—the Institution of Civil Engineers, the Institute of Electrical Engineers, the Institute of Mechanical Engineers, the Royal College of Physicians, and the Royal College of Surgeons.

THE Medical Schools attached to London and provincial hospitals commenced a new session on Tuesday with the customary introductory addresses. Prof. J. R. Bradford, at University College, discussed the positions occupied by biology, anatomy, and physiology in the medical curriculum. Dr. A. P. Laurie addressed the students at St. Mary's Hospital on the medical profession and unhealthy trades. At the London Hospital, Dr. J. Hughlings-Jackson was presented with his portrait and a piece of plate, in recognition of his great services to the London Hospital and Medical College, of his distinguished position in the profession, and of the advance he has effected in medical science by his laborious investigations and profound

insight into the diseases of the nervous system. The presentation was made by Sir James Paget, who also presented the prizes to the students. Mr. G. D. Pollock advised the students at St. George's Hospital as to their methods and aims of work. A valuable address on the more important developments of modern medicine, especially in the department of bacteriology, was given at Westminster Hospital by Dr. S. M. Copeman. Dr. W. J. Mickle discoursed on psychological medicine at Middlesex Hospital, and Dr. G. D'Ath read a paper at Guy's Hospital on "Our Profession, our Patients, our Public, and our Press." The introductory address to the students of the London School of Medicine for Women was given by Miss Ellaby.

THE annual exhibition of natural scientific specimens of the South London Natural History Society will be held at the St. Martin's Town Hall, Charing Cross, on the evening of October 17.

A PORTRAIT bust in bronze of the late Dr. Robert Brown, the botanist, has been presented to the Montrose Town Council by Miss Paton, a kinswoman of the botanist; it has been placed in a niche in the house where Dr. Brown was born in 1773.

THE *Lancet* announces that a subscription has been opened in Bristol to provide for the purchase and retention in that city of the celebrated collection of relics belonging to Jenner in connection with his introduction of vaccination. The collection is at present the property of Mr. Frederick Nockler, of Wotton-under-Edge, and was exhibited by him at the Bristol Exhibition in 1893, and since then in London, at each of which places it attracted a considerable amount of attention.

WAS any record obtained of an earthquake in England on September 13? A correspondent informs us that at 12.25 a.m. on that day, four slight but very distinct shocks were felt two miles north-west of Southampton. The shocks caused the room to shake, and a deep grinding noise was heard; they occurred a few seconds after each other, but the interval between the third and fourth was a little longer than that between the previous tremors. The last shock appears to have been the most intense.

ON Saturday, September 14, the ceremony of breaking the soil preparatory to the erection of the new building of the Brooklyn Institute, was performed in that city. The estimated cost of the new building is several millions of dollars, as its projectors intend it to be one of the finest and most complete of its kind erected. The Institute, which has a membership approaching 4000, has never yet had a suitable home, and it is confidently anticipated that rapid strides in membership and usefulness will be made when the present scheme has been carried to a conclusion.

WE much regret to have to record the death, from injuries received whilst riding his bicycle, of Prof. C. V. Riley, of Washington. Prof. Riley, who was fifty-two years old and a native of England, died on September 14. He was for many years State entomologist of Missouri, and from 1878 till 1894 was Government entomologist of the United States, and as such did very much in devising and applying means to destroy noxious insects. His successful experiment in checking the ravages of the white scale in California, a few years ago, by introducing the parasitic lady bug, *Vedalia cardinalis*, was among the most brilliant triumphs of economic entomology. Prof. Riley has written and published much. He was one of the original Fellows of the American Association for the Advancement of Science, and President of the Zoological Section in 1888, when he delivered an address on the causes of variation in organic forms.

AUTHORITIES have differed much as to the character of crystallised bromine. Gmelin-Kraut's Hand-book describes the solid substance as steel-grey and similar to iodine, whereas Schützenberger says "solid bromine is a crystalline, brown-red

mass, and not grey-blue, as it is often described." The *Zeitschrift für Anorganische Chemie* (x. 1 and 2) gives a short account of its preparation by Henryk Arctowski by a new method. A very concentrated solution of bromine in carbon bisulphide, when cooled to -90° , deposits the halogen in the crystalline form and free from the solvent. When thus obtained, bromine forms a mass of fine needles of some millimetres length, which have a fine dark carmine-red colour like that of chromium trioxide. Solid bromine, obtained in mass, has a crystalline fracture, and has no well-defined metallic lustre like iodine; at the best, it has a dull black metallic appearance.

THE boiling point and the critical temperature of hydrogen, concerning which Prof. K. Olszewski made a preliminary statement in NATURE some little time ago, have since been determined by him with every precaution against error, with the result that his first estimate is proved to have been very near the truth. In the current number of *Wiedemann's Annalen* the process is described in detail. The "expansion method," which had already been successfully employed to determine the critical pressure, was again utilised, the critical temperature being the temperature at which liquid hydrogen, when slowly released from pressure, first boils up, and the boiling point being the temperature attained when the pressure is reduced to that of one atmosphere. The chief difficulty was, as usual, that of determining the temperature accurately. Prof. Olszewski succeeded here by using a coil of thin platinum wire immersed in the hydrogen, whose varying resistance indicated the amount by which it was cooled. This coil was placed in a cast-iron cylinder into which hydrogen was conducted from a reservoir under 180 atmospheres pressure. The cast-iron cylinder could be brought down to a temperature of -210° C., not far from the absolute zero, by means of liquid oxygen. But the critical temperature of hydrogen was found to be still lower, viz. -234.5° C., and had to be found by extrapolation. The boiling point was -243.5° C., or -406.3° F.

IN a report on the Coosa coal-field, published by the Geological Survey of Alabama, Mr. A. M. Gibson describes some remarkable effects of the great "cloud-bursts" which devastated that region in 1872, and are still conspicuous after a lapse of over twenty years. Clean-cut channels, in one case sixty feet wide and three or four feet deep, are described as extending down the mountain sides. They were formed by the direct force of the downpour of water, and along them were carried great masses of rock—one weighing a hundred tons—earth, trees, &c., which formed moraine-like masses at the base, or were scattered far over the lower ground.

VOL. vi. of the new series of Reports of the Geological Survey of Canada has recently been published, and contains the annual reports for the years 1892 and 1893, two special preliminary reports on particular districts (namely, parts of Ontario and Nova Scotia), and chemical and mining reports illustrated by numerous statistical diagrams. Among the matters of general interest, we may note the results of Mr. Low's exploration of Labrador. He finds that the interior of Labrador is well-wooded, instead of being a treeless wilderness as generally supposed, and finds evidence that the continental ice-cap took its rise in the interior of that country. In the chemical report, Mr. G. C. Hoffmann records a remarkable mineralogical discovery. In the kaolinized perthite from a pegmatite vein are found spherules of metallic iron, mostly minute but at times measuring as much as a millimetre in diameter, and having a siliceous nucleus. Mr. Hoffmann refers to similar spherules described by him some years ago (*Trans. Roy. Soc. Canada*, vol. viii. sec. iii. p. 39), on the joint-surfaces of a quartzite, and considers that the explanation suggested in that case applies here again—that the iron has been reduced from limonite by the action of organic matter.

THE Canadian Geological Survey has published the second part of vol. iii. of its monographs on "Palaeozoic Fossils," in which Mr. Whiteaves describes and figures fossils—chiefly Gastropods and Brachiopods—from the Guelph and Hudson River formations.

WE have received from Mr. J. H. Knowles, of Lavender Hill, S.W., a catalogue of various books of science which he has for sale. Many interesting and valuable works on Ornithology, Botany, Astronomy, and other sciences are included.

MESSRS. JARROLD AND SONS have just published an abridged edition of "The Official Guide to the Norwich Castle Museum," at the small price of sixpence. The chief author of the book is Mr. T. Southwell, who has produced a work that should be in the hands of all visitors to the museum, which it so well describes. The little work is admirably compiled, and is illustrated by numerous figures in the text.

THE valuable series of reprints now being published by Mr. Engelmann, of Leipzig, under the title of Ostwald's "Klassiker der Exakten Wissenschaften" has recently had four more volumes added to it. These, numbered 63 to 66, contain respectively the following papers:—"Zur Entdeckung des Elektromagnetismus," by H. C. Oersted and T. J. Seebeck; "Über die Vierfach Periodischen Functionen Zweier Variablen," by C. G. J. Jacobi; "Abhandlung ueber die Functionen Zweier Variabler mit vier Perioden," by G. Rosenhain; and "Die Anfänge des Natürlichen Systemes der Chemischen Elemente," by J. W. Doebereiner and Max Pettenkofer.

WE have received part i. vol. vi. of the *Transactions* of the Norfolk and Norwich Naturalists' Society, by which it appears that the Society has just completed its twenty-sixth year, and to be financially in a prosperous condition; now numbering 275 members, amongst whom we recognise many well-known names. The presidential address, by Dr. Plowright, was mainly devoted to the consideration of some obscure points in the life-history and development of the various forms of *Puccinia*, which he showed had by no means been worked out, and indicated the direction in which further investigations should be pursued. Amongst the papers read before the Society, and published in their *Transactions*, is a very interesting one on "Neolithic Man in Thetford District," with illustrations of the various types of flint implements found in the river-gravels of that neighbourhood. The usual "Report on the Herring Fishery of Yarmouth and Lowestoft" is also published, which having been continued for fourteen consecutive years, in the absence of trustworthy statistics on the subject elsewhere, should be possessed of value; and the same may be said of the very full meteorological notes by Mr. A. W. Preston. A chatty paper on "Old-time Yarmouth Naturalists," by Mr. F. Danby-Palmer, should also be mentioned as giving some particulars of the more noticeable of the old-time naturalists, for which that ornithologically rich section of the east coast has always been remarkable. There are fifteen published papers in all, each of which speaks well for the vitality and usefulness of the Society.

THE additions to the Zoological Society's Gardens during the past week include two Bonnet Monkeys (*Macacus sinicus*, ♀ ♀) from India, presented respectively by Mr. Thomas Mackenzie and Messrs. Davies and Sons; a Chimpanzee (*Anthropopithecus troglodytes*, ♂) from West Africa, presented by Captain G. C. Denton; a Piping Guan (*Pipile cumanensis*) from Uruguay, presented by Mr. P. du Pré Grenfell; four Green Lizards (*Lacerta viridis*), three Wall Lizards (*Lacerta muralis*), European, presented by Mr. C. W. Tytheridge; two Laughing Kingfishers (*Dacelo gigantea*) from Australia, deposited; a Common Seal (*Phoca vitulina*) from Scotland, purchased.

OUR ASTRONOMICAL COLUMN.

RETURN OF FAYE'S COMET.—A telegram from Kiel, received on September 28, announces that Faye's comet was observed by Javelle at Nice on the 26th. At 12h. 34' 8m., Nice time, it was in R.A. 21h. 8m. 11s., and Decl. 1° 54' S. It is accordingly well situated in the north-western part of the constellation Aquarius, crossing the meridian a little before 9 p.m. At the time of observation it was noted as "feeble."

ELEMENTS AND EPHEMERIS OF COMET *a*, 1895 (SWIFT).—Dr. Berberich has computed the following new elements of Swift's comet, from observations made at Mount Hamilton, August 21; Nice, August 31; and Strassburg, September 16.

These elements represent the comet's orbit with a greater degree of accuracy than those previously deduced, and the ephemeris determined from them closely represents observations made at Paris. In continuation of the ephemeris given in NATURE of September 5, we print the following, from *Edinburgh Circular* No. 46:—

T = 1895, Aug. 20, 88480 M. T. Berlin

$$\begin{array}{rcl} \pi - \Omega & = & 167^{\circ} 47' 78'' \\ \Omega & = & 170^{\circ} 16' 17.3'' \\ i & = & 2^{\circ} 59' 24.9'' \\ \phi & = & 40^{\circ} 22' 17.6'' \end{array} \quad \begin{array}{l} 1895.0 \\ \log a = 0.565825 \\ \log q = 0.112686 \\ \text{Period} = 7.059 \text{ years.} \end{array}$$

Ephemeris for Berlin Midnight.

1895.		α app.	δ app.	Bright- ness.
		h. m. s.	° ' "	
Oct. 2	...	1 24 7	+4 32.9	
4	...	1 24 41	+4 23.9	0.62
6	...	1 25 9	+4 15.3	
8	...	1 25 31	+4 7.1	0.56
10	...	1 25 50	+3 59.5	
12	...	1 26 6	+3 52.5	0.50
14	...	1 26 19	+3 46.2	
16	...	1 26 31	+3 40.6	0.44
18	...	1 26 42	+3 35.8	
20	...	1 26 53	+3 31.9	0.38
22	...	1 27 5	+3 29.0	
24	...	1 27 19	+3 27.0	0.33
26	...	1 27 35	+3 25.9	
28	...	1 27 53	+3 25.7	0.29

It will be noticed that the comet is diminishing in brightness, and on October 12 will only be half the brightness at the time of discovery, August 20.

γ VIRGINIS.—Of the many double-star orbits which have recently been computed by Dr. See, of Chicago, none presents more features of interest than that of γ Virginis. This famous double star has been very persistently observed since its discovery in 1718, but none of the orbits previously determined are consistent with the most recent observations. Including some of his own measures, Dr. See finds the following elements (*Astronomical Journal*, No. 352):—

$$\begin{array}{rcl} P & = & 194.0 \text{ years} \\ T & = & 1836.53 \\ e & = & 0.8974 \\ a & = & 3.989 \end{array} \quad \begin{array}{rcl} \Omega & = & 50.4 \\ i & = & 31.0 \\ \lambda & = & 270.0 \\ n & = & 1.8557 \end{array}$$

Apparent orbit:

$$\begin{array}{l} \text{Length of major axis} = 6''.824 \\ \text{minor axis} = 3''.530 \\ \text{Angle of major axis} = 140^{\circ}.4 \\ \text{periastron} = 140^{\circ}.4 \\ \text{Distance of star from centre} = 3''.062 \end{array}$$

A comparison of computed and observed places shows, according to Dr. See, that these elements are probably the most exact yet found for any binary star. It will be seen from the figures given that the line of nodes coincides with the minor axis of the real ellipse, which is also the minor axis of its projection; and, owing to the small inclination, the apparent ellipse is only slightly less eccentric than the real ellipse, so that the foci of the two ellipses nearly coincide. Dr. See points out that one of the consequences of this disposition of the orbit is to make the movement of the radius vector in the apparent orbit very little different from that in the real orbit, so that γ Virginis furnishes the best test we have for the exactness of the law of gravitation in stellar systems. "If there is any deviation from the Keplerian law of areas, it must be extremely slight. There-